ABSTRACT OF THE DISCLOSURE

EMBEDDING DATA IN MATERIAL

A spatial domain image I produced by a source 1 is combined with watermark data Ri to produce a spatial domain watermarked image I'. The watermarked image is produced by an embedder 3 according to the equation

$$Ci'=Ci + \alpha. Ri$$

where Ci and Ci' are wavelet transform coefficients of the image, and α is a scaling factor. α is chosen so that the watermark is imperceptible in the image and to resist removal of the watermark by unauthorised processing. It is desirable that α has the smallest value which achieves that. If α is too big the watermark is perceptible in the image; if it is too small the mark may not survive processing of the image.

α is determined from a trial decoding of the image I in a decoder 4. The decoding is that which would be used to decode the watermarked image I'. A value α' is produced by a calculator S3-S8, to which an offset value is added by an adder S9 to produce α. This produces values of α over the image, which are used to scale the data Ri so as to conceal the data. An image is one example of material to which the invention is applicable.

The step of producing modified coefficient values C_i may not use coefficients of magnitude greater than a threshold T and does not use corresponding information symbols R_i. Alternatively, a threshold T_{clip} may be set. The scaling factor α is calculated using clipped coefficient values and coefficients C_i of magnitude less than T_{clip}.

[Figure 1]